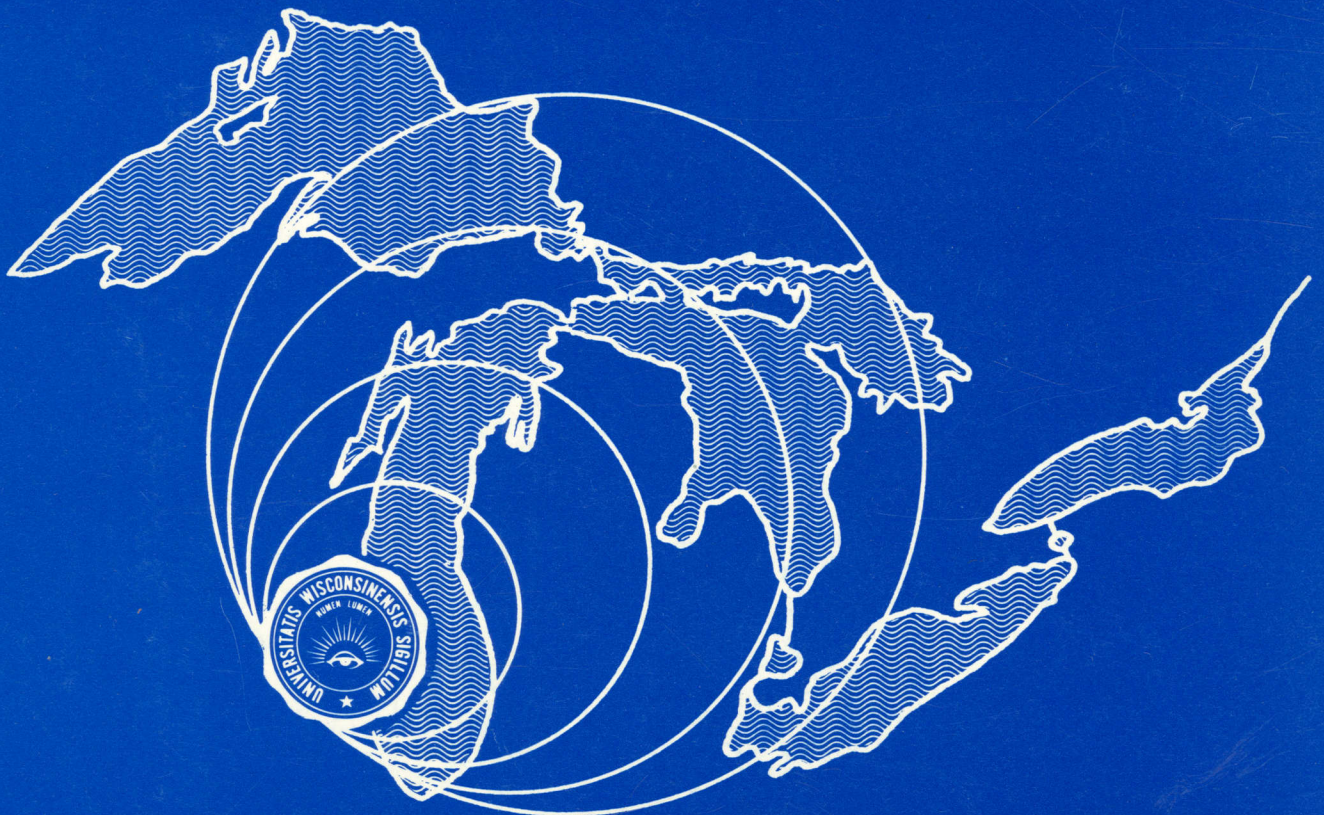
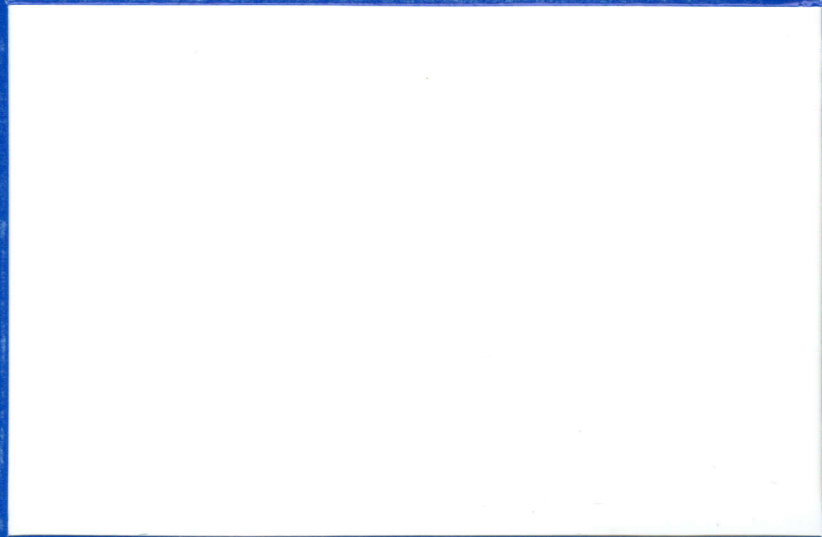
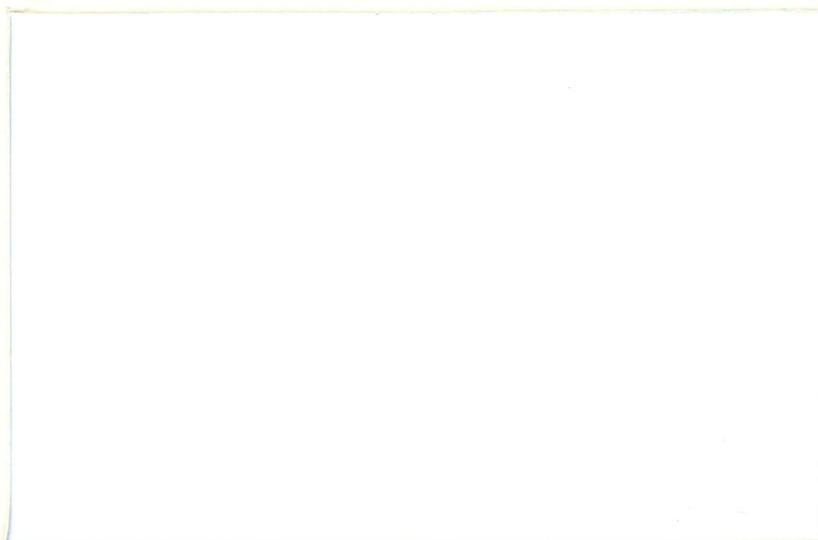


THE UNIVERSITY OF WISCONSIN—MILWAUKEE

CENTER
FOR
GREAT LAKES STUDIES



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EFFECTS OF CONTAINERIZATION ON
GREAT LAKES PORTS

by

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Effects of Containerization on Great Lakes Ports
Special Report No. 2
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I. Introduction

Though in the 1970's the concept of containerization is no longer as explosive as it was in the 1960's, it is far from mundane. The world shipping industry has yet to adapt fully to the many important implications of this leap in shipping technology. The substantial in-port cost reductions possible with containerized cargo handling are better understood and exploited, but the full adjustment to these savings has not yet been made.

Within individual ports, some decisions remain to be made regarding how much more capital should be invested in costly, capital-intensive facilities. In ports where investment has already been high, the question of whether these outlays will be justified by future events remains to be answered. Should the facilities fail to generate sufficient revenues to support themselves, ports will be faced with the impact of these losses on all other port operations.

Among geographically linked ports, the coming of containerization has forced close inspection of the benefits to be gained from regional growth and development. Many persons concerned with shipping and ports are arguing that the potential traffic in containers and other high-density modes does not justify expansion of every port area. Rather, they suggest that regional port authorities be formed, providing within

the region--though not within each port--facilities for the handling of needed types of cargo. Such an approach would minimize competition and investment within a region, along with the losses in efficiency when excess facilities are only partially used. The tradition of locally competitive ports is frustrating any serious approach to regionalism, at least for the present.

Within the shipping industry itself, the onset of increased technological advancement has not been matched with similar progress in all areas. Many gains are yet to be realized from the further standardizing of containers between companies and nations. Though the physical movement of goods has been streamlined, much remains to be done administratively. Simplification of paper work and changes in insurance practices are but two of the areas of concern.

Linkages between shipping and other transport modes have been heavily underscored by the advances of the last decade. In addition to ports themselves new shipping techniques are involving assembly points for goods which may be even distantly removed from the port area. Shippers are more and more faced with delicate interfaces with land modes--especially rail and truck. Likewise LASH and SEABEE vessels are involving more than one type of waterborne vessel in combination.

The Great Lakes-St. Lawrence Seaway system is heavily involved in each of the above-mentioned areas. Though there has been but limited investment in container facilities for

lake ports to date, the question of continuance of such a trend is critical. The general manager of the Chicago Regional Port District, Maxim M. Cohen, suggested that the State of Illinois join the Port in financing a container facility. Mr. Cohen warned that "unless the Port of Chicago has a competitive port facility within the next three to five years, the volume of general cargo will continue to diminish to the degree where it will become inconsequential."¹

U.S. Department of Commerce statistics for 1971 show that presently very little containerized cargo is being handled by Great Lakes ports (Table 1). Center for Great Lakes Studies, Effects of Containerization on Great Lakes Ports, Special Report No. 2, published in 1968, found that considerable container-suitable traffic was moving on the Great Lakes at that time. The present report is an attempt to update these findings and to isolate any significant changes. This evaluation of container-suitable traffic, in conjunction with the results of a second study in progress which hopes to determine the amount of container cargo from the Great Lakes hinterland presently being served by sea-coast ports, will give some indication of the competitive possibilities for expansion in container-service facilities on the Great Lakes.

II. Container Traffic at the Great Lakes Ports

The 1968 report, Effects of Containerization on Great Lakes Ports, studied the effects of containerization on

TABLE 1
FOREIGN OCEANBORNE TRADE OF THE U.S.
CONTAINERIZED CARGO AT SELECTED U.S. PORTS
CALENDAR YEAR 1971, INBOUND/OUTBOUND

	Number of Containers*	Cargo Cu. Ft. (000's)	Commercial L. tons (000's)	Defense L. tons (000's)	Total L. tons (000's)
<u>North Atlantic</u>	<u>499,372</u>	<u>713,717</u>	<u>5,675</u>	<u>571</u>	<u>6,246</u>
New York	344,522	484,628	3,770	437	4,207
Norfolk	77,286	122,685	892	107	999
Baltimore	49,852	70,668	669	19	688
Philadelphia	17,865	22,100	229	6	235
Boston	7,334	11,067	95	---	95
Other Ports	2,513	2,569	20	2	22
<u>South Atlantic</u>	<u>21,407</u>	<u>33,244</u>	<u>285</u>	<u>12</u>	<u>297</u>
Charleston, S.C.	9,331	17,733	132	12	144
Miami	7,902	10,256	99	--	99
Other Ports	4,174	5,255	54	1**	54
<u>Gulf</u>	<u>13,161</u>	<u>15,287</u>	<u>148</u>	<u>14</u>	<u>162</u>
New Orleans	6,860	7,954	67	13	80
Houston	5,260	5,963	67	1	68
Other Ports	1,041	1,370	14	0	14
<u>California</u>	<u>245,396</u>	<u>312,738</u>	<u>1,741</u>	<u>922</u>	<u>2,663</u>
Los Angeles-					
Long Beach	120,833	145,998	1,065	134	1,199
Oakland-					
San Francisco	120,402	162,983	649	786	1,435
Other Ports	4,161	3,757	27	2	29
<u>Pacific Northwest</u>	<u>49,522</u>	<u>64,113</u>	<u>420</u>	<u>108</u>	<u>528</u>
Seattle	41,111	56,882	327	99	426
Portland	5,625	4,404	68	1	69
Other Ports	2,786	2,827	25	8	33
<u>Great Lakes</u>	<u>8,244</u>	<u>13,053</u>	<u>112</u>	<u>1**</u>	<u>112</u>
Chicago	4,679	8,665	64	1**	64
Other Ports	3,565	4,388	48	1**	48

*Mixed units of standard and non-standard size containers **Less than 500 long tons

Source: U.S. Dept. of Commerce, Maritime Administration, Office of Subsidy Administration,
Division of Trade Studies and Statistics, Statistics Branch, 1972.

Great Lakes shipping both on the then-current (1964) level and as projected by the U.S. Army Corps of Engineers in Great Lakes-Overseas General Cargo Traffic Analysis.² (In this study the Corps estimated the total waterborne general cargo traffic generated in the Great Lakes area, determined how much of this traffic was produced in areas tributary to Great Lakes ports and how much actually moved through the lake ports. Using these estimates as a base, the Corps projected the amount of general cargo traffic generated in the Great Lakes area, the amount shipped via the Great Lakes and the future tonnage at principal lake ports for the years 1975 to 2015.)

The purpose of the 1968 report was twofold: first, to analyze the impact of containerization on general cargo traffic in Great Lakes ports; and secondly, based upon the analysis to make a recommendation as to the justification of investment on the part of the Great Lakes ports in container facilities. The report concluded that building complete container facilities at each of the major Great Lakes ports would be a waste of resources. It recommended the building of one or perhaps two complete fully integrated container berths on the Great Lakes and that the individual ports should be equipped to handle the combination vessels carrying both containers and standard breakbulk cargo.

The purpose of the present report is to determine whether the conclusions are still valid in the light of more recent data concerning the general cargo traffic in the Great Lakes ports. In other words, have the trends

upon which the projections and recommendations were based continued through the years after the study was made?

The procedures utilized in the 1968 report have been employed using 1970 as the base year for the classification of general cargo commodities. As was stated in the initial report, the Corps of Engineers considers the Great Lakes area to include the eight lake-border states of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Western Pennsylvania, and Western New York plus eleven additional states contiguous on the west and south of the border states-- Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Kansas, Iowa, Missouri, Kentucky, and West Virginia. This area was selected as the maximum area tributary to the Great Lakes ports on the assumption that overseas traffic will move via a lake port if the Great Lakes-St. Lawrence Seaway route is the most economical or advantageous routing. It was determined that these states include that part of the United States for which the most economical routing for overseas general cargo traffic would be via a lake port. In 1964, the Corps estimated that 51% of the overseas general traffic generated in this area traveled through lake ports. The authors feel that the Corps estimate is much higher than the actual movement of cargo at the present time. The Corps has estimated that by 1985, 59% of the hinterlands general cargo traffic will move through the lake ports.

In order to determine the amount of Great Lakes traffic that could be containerized, the commodities which are

designated as general cargo were separated into three classes: class A, goods that will fit into a container and are of sufficient value to warrant the expense of utilizing containers for their transport overseas; class B, low value goods that would be containerized only to fill containers that might otherwise be transported empty; and class C, general cargo that will not fit into a container and is not valuable enough to warrant containerization, or for some other reason would not be containerized. One inevitable outcome from this type of arbitrary selectiveness is that some commodity groups are not easily placed into one class. For example, a commodity classification such as metal-working machinery and parts may contain some commodities that will fit into containers and some that cannot, or need not, be containerized. In dealing with these types of commodity groups, we have divided the volume of these particular commodities between class A and class C, with the relative shares depending on the nature of the commodity groups. For instance, commodity group 3511 consists of all machinery, except electrical. This commodity group combines what, under the previous commodity classifications (Appendix A) were designated as 722--construction, excavating, mining, and related machinery, including materials handling and conveying machinery and parts; 730--machine tools and other metal working parts; 770--agricultural machinery, components, and parts; and, in addition, several other commodities. Based upon the composition of this group, we assigned 25%

of the tonnage to class A, and 75% to class C. The complete results of this division are listed in Appendices C, D, E, F, G, H, and I. Appendix A contains a listing of the 1964 commodity names and code numbers. The 1970 listing will be found in Appendix B.

In Table 2, the results of the classification of general cargo traffic for all Great Lakes ports in terms of container suitability are presented for 1964 and 1970. Table 3 presents the results for 1964 and 1970 of the classification of the general cargo traffic handled at the five major Great Lakes ports: Chicago, Detroit, Milwaukee, Cleveland, and Toledo. The port of Duluth, the sixth largest port, as well as the other Great Lakes ports, does not handle enough container suitable traffic to merit consideration on an individual basis. In 1970, the five ports handled approximately 85% of the total U.S. Great Lakes general cargo traffic and almost all of the container-suitable traffic. From Table 2, it can also be seen that only 9.6% of general cargo exports and 9.5% of general cargo imports in 1970 were determined to be in class A. These somewhat surprisingly small shares of total Great Lakes general cargo traffic are primarily due to the fact that a few commodities dominate the general cargo traffic. Export traffic is dominated by bagged agricultural products such as wheat flour and semolina, vegetables and preparations, and prepared animal feeds (2041, 2034, 2042); by animal by-products, tallow, animal fats and oils (2015, 2014); and especially by iron and steel products:

TABLE 2

U.S. GREAT LAKES-OVERSEAS GENERAL CARGO TRAFFIC BY
DEGREE OF SUITABILITY FOR CONTAINERIZATION

Including iron and steel rolled and semifinished products

Class	1964		1970	
	Short Tons	Percent of Total	Short Tons	Percent of Total
Exports	2,391,801		2,882,165	
A	378,110	16	276,331	9.6
B	75,220	3	4,701	.2
C	1,938,471	81	2,601,133	90.2
Imports	1,772,557		4,462,025	
A	432,246	25	421,333	9.5
B	56,143	3	51,137	1.1
C	1,284,168	72	3,989,555	89.4

Excluding iron and steel rolled and semifinished products

Class	1964		1970	
	Short Tons	Percent of Total	Short Tons	Percent of Total
Exports	2,326,743		2,071,460	
A	369,624	15.9	232,331	11.2
B	75,220	3.2	4,701	.2
C	1,881,899	80.9	1,834,428	88.6
Imports	810,717		1,050,086	
A	323,527	39.9	368,863	35.1
B	56,143	6.9	51,137	4.9
C	431,117	53.2	630,086	60.0

Sources: Eric Schenker, Effects of Containerization on Great Lakes Ports, Special Report No. 2, Center for Great Lakes Studies, University of Wisconsin-Milwaukee, 1968.

Appendix C.

TABLE 3

OVERSEAS GENERAL CARGO TRAFFIC AT MAJOR GREAT LAKES PORTS
BY DEGREE OF SUITABILITY FOR CONTAINERS
(Short Tons)

1964 - Including Iron and Steel Semifinished Products

	<u>Class A</u>	<u>Class B</u>	<u>Class C</u>	<u>Totals</u>
<u>Exports</u>				
Chicago	103,317 (12%)	45,511 (6%)	680,471 (82%)	829,299
Detroit	43,002 (14%)	7,462 (3%)	245,588 (83%)	296,052
Milwaukee	29,495 (15%)	7,038 (4%)	160,689 (81%)	197,222
Cleveland	24,290 (32%)	2,662 (4%)	48,304 (64%)	75,256
Toledo	14,658 (22%)	229 (--)	53,125 (78%)	68,012
Total Exports	214,762	62,902	1,188,177	1,465,841
<u>Imports</u>				
Chicago	208,371 (32%)	21,716 (3%)	429,173 (65%)	659,260
Detroit	94,939 (18%)	4,474 (1%)	428,856 (81%)	528,269
Milwaukee	25,167 (35%)	12,281 (17%)	35,078 (48%)	72,526
Cleveland	53,015 (26%)	10,432 (5%)	143,098 (69%)	206,545
Toledo	27,681 (25%)	1,090 (1%)	80,852 (74%)	109,623
Total Imports	409,173	49,993	1,117,057	1,576,223
Total Traffic	623,935	112,895	2,305,234	3,042,064

1970 - Including Iron and Steel Semifinished Products

<u>Exports</u>				
Chicago	56,761 (7%)	2,985 (--)	794,405 (93%)	854,151
Detroit	64,099 (9%)	142 (--)	670,011 (91%)	734,252
Milwaukee	48,438 (15%)	427 (--)	273,037 (85%)	321,902
Cleveland	13,922 (7%)	35 (--)	193,081 (93%)	207,038
Toledo	3,377 (5%)	3 (--)	68,429 (95%)	71,809
Total Exports	186,597	3,592	1,998,963	2,189,152
<u>Imports</u>				
Chicago	176,395 (12%)	15,314 (1%)	1,290,336 (87%)	1,482,045
Detroit	86,467 (5%)	11,586 (1%)	1,535,556 (94%)	1,633,609
Milwaukee	46,785 (18%)	599 (--)	218,473 (82%)	265,857
Cleveland	37,451 (7%)	849 (--)	484,440 (93%)	522,740
Toledo	33,816 (11%)	22,789 (7%)	277,401 (82%)	334,006
Total Imports	380,914	51,137	3,806,206	4,238,257
Total Traffic	567,511	54,729	5,805,169	6,427,409

Source: Data from U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1964 and 1970, Part 3, "Waterways and Harbors, Great Lakes."

TABLE 3a

OVERSEAS GENERAL CARGO TRAFFIC AT MAJOR GREAT LAKES PORTS
BY DEGREE OF SUITABILITY FOR CONTAINERS
(Short Tons)

1964 - Excluding Iron and Steel Semifinished Products

	<u>Class A</u>	<u>Class B</u>	<u>Class C</u>	<u>Totals</u>
<u>Exports</u>				
Chicago	103,317 (13%)	45,511 (5%)	669,374 (82%)	818,202
Detroit	43,002 (16%)	7,462 (3%)	214,587 (81%)	265,051
Milwaukee	29,495 (15%)	7,038 (4%)	159,848 (81%)	196,381
Cleveland	16,021 (29%)	2,662 (5%)	36,923 (66%)	55,606
Toledo	14,658 (22%)	229 (--)	52,405 (78%)	67,292
Total Exports	206,493	62,902	1,133,137	1,402,532
<u>Imports</u>				
Chicago	167,837 (54%)	21,716 (7%)	123,057 (39%)	312,610
Detroit	68,907 (49%)	4,474 (3%)	68,336 (48%)	141,717
Milwaukee	19,621 (47%)	12,281 (29%)	10,006 (24%)	41,908
Cleveland	27,452 (32%)	10,432 (12%)	47,428 (56%)	85,312
Toledo	23,904 (32%)	1,090 (1%)	49,951 (67%)	74,945
Total Imports	307,721	49,993	298,778	656,492
Total Traffic	514,214	112,895	1,431,915	2,059,024

1970 - Excluding Iron and Steel Semifinished Products

<u>Exports</u>				
Chicago	35,777 (7%)	2,985 (1%)	461,162 (92%)	499,924
Detroit	64,013 (12%)	142 (--)	463,204 (88%)	527,359
Milwaukee	48,162 (15%)	427 (--)	271,788 (85%)	320,377
Cleveland	12,074 (22%)	35 (--)	42,077 (78%)	54,186
Toledo	3,377 (5%)	3 (--)	67,052 (95%)	70,432
Total Exports	163,403	3,592	1,305,283	1,472,278
<u>Imports</u>				
Chicago	145,570 (48%)	15,315 (5%)	142,118 (47%)	303,003
Detroit	75,890 (36%)	11,586 (5%)	125,438 (59%)	212,914
Milwaukee	43,862 (34%)	599 (1%)	82,963 (65%)	127,424
Cleveland	32,628 (35%)	849 (1%)	59,190 (64%)	92,667
Toledo	31,006 (23%)	22,789 (17%)	80,040 (60%)	133,835
Total Imports	328,956	51,138	489,749	869,843
Total Traffic	492,359	54,730	1,795,032	2,342,121

Source: Data from U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1964 and 1970, Part 3, "Waterways and Harbors, Great Lakes."

iron and steel ingots and other primary forms including blanks for tube and pipe (3314); iron and steel plates and sheets (3316); primary iron and steel products, not elsewhere classified, including castings in the rough (3319), and iron and steel scrap (4011).

The great majority of general cargo import traffic is accounted for by iron and steel products (see Table 2). These include iron and steel bars, rods, angles, shapes and sections including sheet piling (3315), iron and steel pipe and tube (3316, 3317), and primary iron and steel products, not elsewhere classified, including castings in the rough (3319).

Traffic in these iron and steel products has exhibited tremendous growth over the last decade. In 1964, of the total general cargo 16% of the exports and 25% of the imports were in class A cargo. Table 2 points up the significant decrease in the percentage of container-suitable general cargo traffic between 1964 and 1970. This decline is due in part to rapid growth of both rolled and semifinished iron and steel products. Imports of these products rose from 961,840 short tons in 1964 to 3,411,939 short tons in 1970, while exports changed from 65,058 short tons to 810,705 short tons (from Table 2).

In the years previous to 1964, these iron and steel products accounted for only a very small fraction of general cargo exports and only a small part of general cargo imports.

However, beginning in 1965, imports of iron and steel products showed a large increase, and exports of these began to rise sharply two years later. As an illustration of the growth of these iron and steel rolled and semi-finished products: in 1964, the total iron and steel semi-finished imports, consisting of commodity groups 603, 605, 606, 607, 608, and 609, totaled 1,003,433 tons; in 1970, the imports of iron and steel plates and sheets (3316), alone, totaled 2,431,034 tons.

In order to analyze the effects of the sharp growth of rolled and semifinished iron and steel products on Great Lakes general cargo traffic, especially in regard to containerization, the tables of the original report have been updated to include the years 1965 through 1970. The same tables have been compiled excluding from the general cargo traffic the iron and steel rolled and semifinished products (commodity classifications 3314, 3315, 3316, 3317, and 3319) for the years 1959 through 1970. The purpose behind the construction of these additional tables is two fold. First, rolled and semifinished iron and steel products increased over the past decade until by 1970 they accounted for over three-fourths of general cargo imports, and over one-fourth of general cargo exports, consequently dominating the other commodity classifications. The exclusion of the iron and steel products allows the changes in the other commodity groups during the period 1959-1970 to be more easily observed. Secondly, there

exists a certain amount of disagreement as to which classification these iron and steel products should be assigned. Some researchers have stated that all iron and steel products should be considered to be container suitable, while others have concluded just the opposite. In this report, rolled iron and steel products have been assigned to the C class, while other iron and steel semifinished products have been divided between class A and class C depending on the nature of the particular products involved--size, quality, and value, for example.

When the iron and steel rolled and semifinished products are excluded from general cargo traffic, the percentage of general cargo traffic in 1970 found to be in class A is higher for all ports (for all Great Lakes together as well as for the individual ports of Chicago, Detroit, Milwaukee, Toledo, and Cleveland) than when these products are included in the general cargo figures.

For all Great Lakes ports, the percentage of general cargo traffic determined to be in class A was 9.5% in 1970, as compared to 19.5% in 1964. After the total tonnages of iron and steel semifinished products have been excluded from general cargo traffic, the percentage of class A traffic rises to 19.3% for 1970, as compared to 22.1% in 1964. As can be seen from these figures there is very little difference in shares of class A general cargo for 1964, whether or not total tonnages of iron and steel semifinished products are included; however, for 1970, when these same products are

excluded the percentages rise from 9.5% to 19.3%--a significant increase. When the iron and steel semifinished and rolled products are separated from the general cargo, the percentage of general cargo traffic which is class A is approximately the same for 1964 and 1970, significantly evidencing the growth of iron and steel products over that time.

Comparing Table 3 for 1964 and 1970 with Table 3a, which excludes the iron and steel rolled and semifinished products from general cargo traffic, demonstrates that the growth in the shipping of these products has been concentrated primarily in imports. There is a significant difference between percentages of A classifications for all general cargo imports and percentages of general cargo imports excluding the iron and steel products. These percentages for 1970 for the five individual ports considered are Chicago (12, 48), Detroit (5, 36), Milwaukee (18, 34), Cleveland (7, 35), and Toledo (11, 23). On the other hand, it can be seen that except for the port of Cleveland, there is very little change in the shares of general cargo exports found to be in class A: Chicago (7, 7), Detroit (9, 12), Milwaukee (15, 15), Cleveland (7, 22), and Toledo (5, 5).

The ports most affected when figures for iron and steel semifinished products are not included in the analysis are Chicago, Detroit, and Cleveland. Iron and steel semifinished products account for 1,627,588 tons or almost 70% of Detroit's total general cargo traffic of 2,367,861, for 582,925 tons

or 80% of Cleveland's general cargo traffic of 729,778 tons, and 1,533,269 tons or 65% of Chicago's 2,336,196 tons.

The second most notable difference between 1970 and 1964 is in the decline in the percentage of general cargo within class B--low value goods that would physically fit into containers but because of their relatively low value would be containerized only in order to fill containers that might otherwise move empty to or from a port. In 1964, approximately 3% of general cargo traffic was assigned to class B; in 1970, the percentage was less than 1%. The growth of the iron and steel rolled and semifinished products accounted for part of this decline; however, the primary reason lies in the changes in the commodity classification system employed by the U.S. Army Corps of Engineers.

In 1964, two-thirds of the general cargo belonging to class B was listed under three commodity classifications: 095 and 098, both listed as animal products, inedible, not elsewhere classified; and 335, vegetable fiber semimanufactured and manufactured products, not elsewhere classified.

By 1970, the commodity classification system had been reorganized with most of the previously "not elsewhere classified" categories disappearing and with new, more explicit classifications replacing them. Most of these new commodity classifications have been assigned to either class A or class C. The remaining, generalized categories are fairly insignificant and consequently the size of the B class has diminished to less than 1% of the total general cargo

traffic. When the iron and steel semifinished products are deleted from general cargo traffic, however, the commodities in class B comprise less than 2% of the total traffic for 1970.

The principal class A exports were fresh and frozen meat (2011), canned or otherwise prepared vegetables and preparations (2034), basic chemicals and chemical products (2819), and 50% of primary iron and steel products, not elsewhere classified (3319).

The principal class A imports were alcoholic beverages (2081); basic textile products, except textile fibers (2211); basic chemicals and chemical products (2819); glass and glass products (3211); 50% of primary iron and steel products (3319); 50% of fabricated metal products, except ordnance, machines, and transportation equipment (3411); and 25% of motor vehicles, parts, and equipment (3711).

III. Estimates of Future Container Traffic

As has been indicated earlier, the purpose of the report is the estimation of future container-suitable traffic in order to determine whether investment in complete container facilities will be justified by the resulting savings in shipping costs; and, in addition, at which ports such investment should be encouraged. Accordingly, analyses of the general cargo traffic for 1970 have been undertaken as a basis for the estimates of future container suitability in conjunction with the projections of the U.S. Army Corps of Engineers in Great Lakes-Overseas General Cargo Traffic Analysis.

It would be expected that iron and steel rolled and semifinished products would continue to dominate general cargo imports and increase their share of general cargo exports, with bagged agricultural products accounting for the same relative shares of general cargo exports.

Table 4 shows the shares of total imports at Great Lakes ports of rolled and semifinished iron and steel products, and of alcoholic beverages, one of the major class A import commodities.

TABLE 4
SHARE OF TOTAL IMPORTS AT GREAT LAKES PORTS
OF ROLLED AND FINISHED (IRON AND STEEL) PRODUCTS
AND WINES AND LIQUORS, 1959-1970

<u>Year</u>	<u>Steel Products %</u>	<u>Liquors & Wines %</u>
1959	34.8	3.6
1960	15.1	5.2
1961	18.6	5.0
1962	21.3	4.3
1963	27.3	4.0
1964	35.7	3.2
1965	62.1	1.8
1966	62.6	1.8
1967	65.8	1.4
1968	75.1	1.3
1969	63.4	1.5
1970	76.5	1.6

Sources: U.S. Army Corps of Engineers, Great Lakes-Overseas General Cargo Traffic Analysis, March, 1967, Table B-5, p. B-12.

Data from U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1965-1970, Part 3, "Waterways and Harbors, Great Lakes."

The impressive growth of the iron and steel products is demonstrated by the large jump in the percentages beginning in 1965. Until 1965, these products accounted for 15-35% of the total imports. In 1965, however, the percentage rose to 62%, and for the years 1965 through 1970 ranged from 62-76%. It is somewhat ironic that the original report was based on 1964 data, and the unexpected increases in the importing of iron and steel rolled and semifinished products occurred one year later. These sudden increases from 1964 to 1965 can be attributed to the growth in import tonnage of two particular commodity classifications (3315 and 3316), including iron and steel plates, sheets, bars, rods, angles, shapes and sections, including sheet piling. In 1964, their combined tonnage imported totaled 1,043,152 tons (603 and 609); in 1965, imports of these products more than doubled to 2,242,363 tons. One probable reason for these rather large and unforeseen increases has been the steadily rising price level of iron and steel in the United States, providing an incentive to import rather than purchase the same domestically produced products. This was coupled with rising wages, with the result that beginning in 1965, iron and steel products produced overseas became price competitive with domestically produced iron and steel products.

As a result of the sudden growth in imports of iron and steel products, the share of total imports of alcoholic beverages decreased over the same period. Actually the total

tonnage of liquors and wines imported increased at a fairly steady rate over the period 1964-1970, but in terms of percentage of total imports, accounts for less than 2% of general cargo imports, less than half of its share previous to 1965.

For the future, it is assumed that iron and steel rolled and semifinished products will account for 60-70% of general cargo imports.

One additional effect of the growth in iron and steel imports has been felt in the division of general cargo traffic between imports and exports. Except for 1959, when the St. Lawrence Seaway opened, general cargo imports were always outnumbered by general cargo exports, although increasing steadily from 32% of total general cargo traffic in 1960 to 42% in 1964. However, the following year, 1965, imports rose dramatically to account for over 60% of total traffic, and have remained near that level since then. The division of overseas general cargo traffic between exports and imports since the Seaway opened in 1959 can be seen in Table 5.

The exact extent to which the growth of iron and steel products has affected the division of traffic between exports and imports can be seen by comparing Table 5 with Table 6, which excludes iron and steel rolled and semifinished products from the general cargo data. The change in the division is dramatic.

In the original projections of future general cargo traffic for the Great Lakes ports, imports were assumed to

TABLE 5

GREAT LAKES OVERSEAS GENERAL CARGO IMPORTS AND EXPORTS, 1959-1970
(1,000 Short Tons)

<u>Year</u>	<u>Total General Cargo Traffic</u>	<u>General Cargo Imports Tons</u>	<u>% of Traffic</u>	<u>General Cargo Exports Tons</u>	<u>% of Traffic</u>
1959	1,780	974	55%	806	45%
1960	2,266	737	32%	1,529	68%
1961	3,154	849	27%	2,305	73%
1962	2,740	1,045	38%	1,695	62%
1963	3,261	1,303	40%	1,958	60%
1964	4,164	1,773	42%	2,391	58%
1965	5,641	3,655	65%	1,986	35%
1966	5,801	3,783	65%	2,018	35%
1967	6,520	4,154	64%	2,366	36%
1968	8,474	6,282	74%	2,192	26%
1969	8,563	4,598	54%	3,965	46%
1970	7,344	4,462	61%	2,071	39%

Sources: U.S. Army Corps of Engineers, Great Lakes-Overseas General Cargo Traffic Analysis, March, 1967, Table 29, p. 66, and Table B-6, p. B-19.

Data from U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1959-1970, Part 3, "Waterways and Harbors, Great Lakes.

TABLE 6
GREAT LAKES OVERSEAS GENERAL CARGO IMPORTS AND EXPORTS, 1959-1970,
EXCLUDING IRON AND STEEL SEMIFINISHED PRODUCTS
(1,000 Short Tons)

<u>Year</u>	<u>Total General Cargo Traffic</u>	<u>General Cargo Imports Tons</u>	<u>% of Traffic</u>	<u>General Cargo Exports Tons</u>	<u>% of Traffic</u>
1959	1,317	519	39%	798	61%
1960	1,789	534	30%	1,255	70%
1961	2,786	562	20%	2,224	80%
1962	2,312	652	28%	1,660	72%
1963	2,570	699	27%	1,871	73%
1964	3,138	811	26%	2,327	74%
1965	3,074	1,111	36%	1,963	64%
1966	3,153	1,142	36%	2,011	64%
1967	3,445	1,086	32%	2,359	68%
1968	3,423	1,248	36%	2,175	64%
1969	4,548	1,304	28%	3,244	72%
1970	3,122	1,050	34%	2,071	66%

Sources: Table 5.

Data from U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1959-1970, Part 3, "Waterways and Harbors, Great Lakes."

account for 45% of future traffic and exports for 55%.³ That division was based on the data for the years up to and including 1964, and also on the expectation of continued expansion of export activities by Midwest manufacturers. On the basis of current data and the expected continued expansion of iron and steel imports through Great Lakes ports, we now are assuming that imports will account for 60% of total traffic at Great Lakes ports, and exports 40%. Using this division, future general cargo traffic at Great Lakes ports as projected by the Army Corps of Engineers is presented in Table 7.

TABLE 7

ESTIMATED FUTURE GENERAL CARGO IMPORTS AND EXPORTS
AT GREAT LAKES PORTS
(1,000 Short Tons)

<u>Year</u>	<u>Total Traffic*</u>	<u>Imports (60%)</u>	<u>Exports (40%)</u>
1975	5,600	3,360	2,240
1985	6,700	4,020	2,680
1995	7,600	4,560	3,040
2005	8,450	5,070	3,380
2015	9,200	5,520	3,680

*Projections from U.S. Army Corps of Engineers, Great Lakes-Overseas General Cargo Traffic Analysis, March, 1967, p. 126.

As stated earlier, it is expected that iron and steel rolled and semifinished products will account for approximately 60-70% of total general cargo imports. Coupled with the remaining class C import commodities, we expect that 90%

of total general cargo imports will be composed of class C commodities; that is, only 10% of general cargo imports will be container suitable. (We have combined class A and class B into a single container-suitable category on the assumption that class B imports will be containerized in order to achieve a balanced flow of container traffic on the Great Lakes.) The subsequent division of projected import traffic for all ports is presented in Table 8.

TABLE 8

PROJECTED OVERSEAS GENERAL CARGO IMPORT TRAFFIC
AT GREAT LAKES PORTS BY SUITABILITY FOR CONTAINERIZATION
(1,000 Short Tons)

<u>Year</u>	<u>Total Imports</u>	<u>Class C (90%)</u>	<u>Container Suitable</u>
1975	3,360	3,024	336
1985	4,020	3,618	402
1995	4,560	4,104	456
2005	5,070	4,563	507
2015	5,520	4,968	552

Source: Derived from Table 7.

General cargo exports, unlike imports, are not dominated by iron and steel products. As has been discussed earlier, the growth of the iron and steel products as a share of general cargo has taken place primarily in imports, although these products along with bagged agricultural products and iron and steel scrap do account for most of the general cargo export traffic. Other important general cargo export commodities are machinery, transportation equipment, and animal

products and by-products. The extent to which the primary, class C, export commodities account for total general cargo export traffic is demonstrated in Table 9. Table 10 indicates the share of the ten primary class C commodities when iron and steel semifinished products are excluded.

Except for the year 1961, when exports of iron and steel scrap were abnormally high, until 1965 the top ten class C commodities accounted for less than 75% of total general cargo exports. Since 1965, however, these principal class C commodities have accounted for 78-87%. These results indicate that it is realistic to assume that the ten principal class C commodities will continue to account for 80-85% of general cargo exports.

Since 90.2% of general cargo exports were determined to be unsuitable for containerization for 1970 (Table 2), it is assumed that 90% of future general cargo exports will be unsuitable for containerization.

The principal class A export commodities in recent years have been vegetables and preparations, meat and meat products, chemicals, and motor vehicle parts. These commodities accounted for over 75% of class A exports in 1970. In a study entitled Industrial Growth and World Trade,⁴ Alfred Maizels has estimated the anticipated rates of growth of world trade in manufactures, the results of which are shown in Table 11.

Chemicals and transport equipment and machinery were expected to show the highest rates of growth of manufactures.

TABLE 9

SHARE OF TOTAL GREAT LAKES GENERAL CARGO EXPORTS
OF TEN PRINCIPAL CLASS C COMMODITIES, 1959-1970

<u>Year</u>	<u>Total General Cargo Exports</u>	<u>Total of Ten Commodities</u>	<u>Ten Commodities Share of Total</u>
1959	805,864	337,365	42%
1960	1,529,530	1,140,029	74%
1961	2,305,591	1,883,736	82%
1962	1,695,467	1,157,274	68%
1963	1,958,029	1,372,436	70%
1964	2,391,801	1,735,448	72%
1965	1,985,884	1,589,443	80%
1966	2,018,345	1,671,256	83%
1967	2,366,241	2,024,080	87%
1968	2,192,368	1,719,934	78%
1969	3,965,434	3,429,613	86%
1970	2,882,165	2,417,899	84%

Sources: U.S. Army Corps of Engineers, Great Lakes-Overseas
General Cargo Traffic Analysis, March, 1967, Table
B-6.

Data from U.S. Army Corps of Engineers, Waterborne
Commerce of the United States, 1965-1970, Part 3,
"Waterways and Harbors, Great Lakes."

TABLE 10

SHARE OF TOTAL GREAT LAKES GENERAL CARGO EXPORTS
OF TEN PRINCIPAL CLASS C COMMODITIES, 1959-1970,
EXCLUDING IRON AND STEEL SEMIFINISHED PRODUCTS

<u>Year</u>	<u>Total General Cargo Exports</u>	<u>Total of Ten Commodities</u>	<u>Ten Commodities Share of Total</u>
1959	798,235	337,365	42%
1960	1,255,434	934,425	74%
1961	2,223,898	1,850,282	83%
1962	1,660,313	1,067,881	64%
1963	1,871,412	1,320,128	71%
1964	2,326,714	1,731,503	74%
1965	1,962,792	1,589,443	81%
1966	2,011,465	1,671,256	83%
1967	2,358,777	2,024,080	86%
1968	2,175,441	1,719,888	79%
1969	3,244,382	2,885,300	88%
1970	2,071,460	1,777,061	86%

Sources: Table 9.

Data from U.S. Army Corps of Engineers, Waterborne
Commerce of the United States, 1959-1970, Part 3,
"Waterways and Harbors, Great Lakes."

TABLE 11

ESTIMATED RATE OF CHANGE OF WORLD TRADE IN MANUFACTURES BY
COMMODITY GROUP, 1959-1973

<u>Commodity Group</u>	<u>Percent Compound Annual Rates of Growth, 1959-73</u>
Metals	4.50
Machinery	6.75
Transport Equipment	6.75
Other Metal Goods	2.81
Chemicals	7.00
Textiles and Clothing	-2.56
Other Manufactures	4.88

Source: U.S. Army Corps of Engineers, Great Lakes-Overseas General Cargo Traffic Analysis, March, 1967, p. 109, taken from Alfred Maizels, Industrial Growth and World Trade (Cambridge: Harvard University Press, 1963), p. 403, Table 15-7.

Data for 1970 has indicated that the manufactures have shown as much growth as anticipated; however, for the Great Lakes, some of the class C commodities such as iron and rolled and semifinished products have shown far greater growth than anticipated, more than offsetting the growth in the class A commodities. Consequently, it is assumed that container-suitable commodities (class A and class B) will continue to account for approximately only 10% of future general cargo traffic.

Using this data, the division of projected future general cargo export traffic at Great Lakes ports in terms of container suitability is presented in Table 12.

TABLE 12

PROJECTED OVERSEAS GENERAL CARGO EXPORT TRAFFIC
AT ALL GREAT LAKES PORTS BY SUITABILITY FOR CONTAINERIZATION
(1,000 Short Tons)

<u>Year</u>	<u>Total Exports</u>	<u>Class C (90%)</u>	<u>Class A (10%)</u>
1975	2,240	2,016	224
1985	2,680	2,412	268
1995	3,040	2,736	304
2005	3,380	3,042	338
2015	3,680	3,312	368

Source: Derived from Table 7.

By combining the data from Tables 8 and 12, estimates of the total projected container-suitable traffic on the Great Lakes can be derived. These are presented in Table 13.

TABLE 13

ESTIMATED CONTAINER-SUITABLE TRAFFIC
ON THE GREAT LAKES, 1975-2015
(1,000 Short Tons)

<u>Year</u>	<u>Imports (Class A&B)</u>	<u>Exports (Class A)</u>	<u>Total</u>
1975	336	224	560
1985	402	268	670
1995	456	304	760
2005	507	338	845
2015	552	368	920

Table 13 indicates that a substantial amount of container-suitable cargo will be shipped through Great Lakes ports in the future, enough to warrant considering the provision of some facilities to accommodate container ships. In order to determine whether facilities are warranted at an individual port, however, there must be some estimate of the volume of container-suitable traffic that will be generated at that port.

The Corps of Engineers has estimated future general cargo for the individual ports of Chicago, Milwaukee, and Cleveland. Estimates derived for Detroit and Toledo have been based on each port's past share of the total Great Lakes general cargo traffic. Table 14 shows Detroit's and Toledo's shares for the years 1959-1970.

In the original report, Detroit's share of the total Great Lakes projected general cargo traffic was assumed to be 17%, Detroit's average share based on the previous six years. Toledo's share was determined to be 7% also on the

TABLE 14
DETROIT'S AND TOLEDO'S SHARE OF GREAT LAKES
GENERAL CARGO TRAFFIC, 1959-1970

<u>Year</u>	<u>Detroit</u>	<u>Toledo</u>
1959	14%	6.1%
1960	24%	5.8%
1961	15%	6.7%
1962	16%	6.0%
1963	16%	6.2%
1964	19%	4.6%
1965	29%	7.5%
1966	27%	7.3%
1967	29%	7.5%
1968	29%	5.3%
1969	25%	4.2%
1970	32%	5.5%

Sources: Data from U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1959-1970, Part 3, "Waterways and Harbors, Great Lakes."

U.S. Army Corps of Engineers, Great Lakes-Overseas General Cargo Traffic Analysis, March, 1967, p. 133.

basis of the previous six years, but with the expectation that there would be some growth of traffic relative to other Great Lakes ports. However, it is evident that Detroit's share jumped significantly to 29% in 1965 and has remained at about that level since. Toledo's share exhibited initial growth from 1965-1967, then decreased somewhat. Based on the historical trend of the past 12 years, and with the expectation that there will be no drastic changes in the future, it is now assumed that Detroit's share will be 29% and Toledo's share 6%. These ratios were applied to the projections of future total Great Lakes general container-suitable traffic to obtain projections for the ports of Detroit and Toledo. Estimates of the future container-suitable traffic at the five primary ports of Chicago, Detroit, Milwaukee, Cleveland, and Toledo are presented in Table 15.

In order to obtain a complete overview of the directions of flow of future general cargo traffic at the five major Great Lakes ports, the estimates in Table 15 traffic have been divided between exports and imports. Estimates are based on historical patterns and on the division of traffic which existed in the ports in 1970. These divisions for the five principal ports of Chicago, Detroit, Milwaukee, Cleveland, and Toledo are shown in Table 16.

As a result of the tremendous growth of iron and steel rolled and semifinished imports described earlier in the report, imports, at all ports except Milwaukee, were greater than exports. In the original report, based upon 1964 data,

TABLE 15

PROJECTED GENERAL CARGO AT THE PRINCIPAL
GREAT LAKES PORTS
(1,000 Short Tons)

	<u>1975</u>	<u>1985</u>	<u>1995</u>	<u>2005</u>	<u>2015</u>
Chicago	2,080	2,330	2,520	2,710	2,900
Cleveland	565	720	825	930	1,035
Detroit	1,624	1,943	2,204	2,450	2,668
Milwaukee	615	715	805	885	960
Toledo	<u>336</u>	<u>402</u>	<u>456</u>	<u>507</u>	<u>552</u>
Total	5,220	6,110	6,810	7,582	8,115

Sources: U.S. Army Corps of Engineers, Great Lakes-Overseas General Cargo Traffic Analysis, March, 1967, Table 62, p. 133.

Table 14.

TABLE 16

ESTIMATED FUTURE DIVISION OF GENERAL CARGO
TRAFFIC AT PRINCIPAL GREAT LAKES PORTS - 1970

<u>Ports</u>	<u>Exports</u>	<u>Imports</u>
Chicago	40%	60%
Detroit	30%	70%
Milwaukee	50%	50%
Cleveland	30%	70%
Toledo	20%	80%

Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1970, Part 3, "Waterways and Harbors, Great Lakes."

the ports of Chicago and Milwaukee handled more export traffic than import, and these two ports still handle the largest relative amounts of export traffic, 40% and 50% respectively. Chicago exports a large variety of goods produced nearby, while Milwaukee handles large amounts of relief cargo exports. The other ports handle primarily iron and steel products.

The percentages in Table 16 have been applied to the general cargo traffic projections in Table 15 to obtain a complete overview of projected general cargo traffic at the principal Great Lakes ports. Their results are shown in Table 17.

Table 18 indicates the distribution of general cargo traffic at the five major Great Lakes ports in 1970 and is broken down into degrees of container suitability, i.e., classes A and B, and class C.

Applying these percentages to the results in Table 17, future general cargo exports and imports by container suitability are estimated and shown in Table 19. Results are consolidated in Tables 20-24.

The projected figures for 1975 for all ports are much lower than the forecasts presented in the original report. There are three principal reasons for this outcome. The unprecedented growth in imports, and to a significant extent in exports, of iron and steel rolled and semifinished products, most of which are unsuitable for containerization,

TABLE 17

ESTIMATED FUTURE GENERAL CARGO EXPORTS AND IMPORTS
AT MAJOR GREAT LAKES PORTS
(1,000 Short Tons)

Exports

	<u>1975</u>	<u>1985</u>	<u>1995</u>	<u>2005</u>	<u>2015</u>
Chicago	832	932	1,008	1,084	1,160
Detroit	487	583	661	735	800
Milwaukee	307	357	402	442	480
Cleveland	170	216	248	279	310
Toledo	<u>68</u>	<u>80</u>	<u>91</u>	<u>101</u>	<u>110</u>
Total	1,864	2,168	2,410	2,641	2,860

Imports

Chicago	1,248	1,398	1,512	1,626	1,740
Detroit	1,137	1,360	1,543	1,715	1,868
Milwaukee	308	358	403	443	480
Cleveland	395	504	577	651	725
Toledo	<u>268</u>	<u>322</u>	<u>365</u>	<u>406</u>	<u>442</u>
Total	3,356	3,942	4,400	4,841	5,255

Sources: Tables 15 and 16.

TABLE 18

ESTIMATED DISTRIBUTION OF GENERAL CARGO TRAFFIC
AT THE MAJOR GREAT LAKES PORTS BY DEGREE
OF CONTAINER SUITABILITY - 1970

Exports

	<u>A & B</u>	<u>C</u>
Chicago	10%	90%
Detroit	10%	90%
Milwaukee	15%	85%
Cleveland	10%	90%
Toledo	5%	95%

Imports

Chicago	10%	90%
Detroit	5%	95%
Milwaukee	20%	80%
Cleveland	10%	90%
Toledo	20%	80%

Source: Table 3.

TABLE 19

PROJECTED TRAFFIC AT MAJOR GREAT LAKES
PORTS BY DEGREE OF CONTAINER SUITABILITY
(1,000 Short Tons)

Exports

	<u>1975</u>	<u>1985</u>	<u>1995</u>	<u>2005</u>	<u>2015</u>
Chicago Total	832	932	1,008	1,084	1,160
A & B	83	93	101	108	116
C	749	839	907	976	1,044
Detroit Total	487	583	661	735	800
A & B	49	58	66	74	80
C	438	525	595	661	720
Milwaukee Total	307	357	402	442	480
A & B	46	54	60	66	72
C	261	303	342	376	408
Cleveland Total	170	216	248	279	310
A & B	17	22	25	28	31
C	153	194	223	251	279
Toledo Total	68	80	91	101	110
A & B	3	4	5	5	6
C	65	76	86	96	104

Imports

Chicago Total	1,248	1,398	1,512	1,626	1,740
A & B	125	140	151	163	174
C	1,123	1,258	1,361	1,463	1,566
Detroit Total	1,137	1,360	1,543	1,715	1,868
A & B	57	68	77	86	93
C	1,080	1,292	1,466	1,629	1,775
Milwaukee Total	308	358	403	443	480
A & B	62	72	81	89	96
C	246	286	322	354	384
Cleveland Total	395	504	577	651	720
A & B	40	50	58	65	72
C	355	454	519	586	648
Toledo Total	268	322	365	406	442
A & B	54	64	73	81	88
C	214	258	292	325	354

Sources: Tables 17 and 18.

TABLE 20

PROJECTED CONTAINER-SUITABLE GENERAL CARGO
TRAFFIC AT PRINCIPAL GREAT LAKES PORTS
(1,000 Short Tons)

	<u>1975</u>	<u>1985</u>	<u>1995</u>	<u>2005</u>	<u>2015</u>
Chicago					
Exports	83	93	101	108	116
Imports	<u>125</u>	<u>140</u>	<u>151</u>	<u>163</u>	<u>174</u>
Total	208	233	252	271	290
Detroit					
Exports	49	58	66	74	80
Imports	<u>57</u>	<u>68</u>	<u>77</u>	<u>86</u>	<u>93</u>
Total	106	126	143	160	173
Milwaukee					
Exports	46	54	60	66	72
Imports	<u>62</u>	<u>72</u>	<u>81</u>	<u>89</u>	<u>96</u>
Total	108	126	141	155	168
Cleveland					
Exports	17	22	25	28	31
Imports	<u>40</u>	<u>50</u>	<u>58</u>	<u>65</u>	<u>72</u>
Total	57	72	83	93	103
Toledo					
Exports	3	4	5	5	6
Imports	<u>54</u>	<u>64</u>	<u>73</u>	<u>81</u>	<u>88</u>
Total	57	68	78	86	94
Total-5 Ports	536	625	697	765	828

Source: Table 19.

TABLE 21

DISTRIBUTION OF OVERSEAS GENERAL CARGO TRAFFIC AT PRINCIPAL
GREAT LAKES PORTS BY SUITABILITY FOR CONTAINERIZATION1964 - Including iron and steel semifinished products

<u>Port</u>	<u>Container Suitable</u>	<u>Not Container Suitable</u>
Chicago	25.5%	74.5%
Detroit	18.2%	81.8%
Milwaukee	27.4%	72.6%
Cleveland	31.0%	69.0%
Toledo	24.6%	75.4%
Total, All Ports	24.2%	75.8%

Source: Table 3.

TABLE 22

DISTRIBUTION OF OVERSEAS GENERAL CARGO TRAFFIC AT PRINCIPAL
GREAT LAKES PORTS BY SUITABILITY FOR CONTAINERIZATION1964 - Excluding iron and steel semifinished products

<u>Port</u>	<u>Container Suitable</u>	<u>Not Container Suitable</u>
Chicago	29.9%	70.1%
Detroit	30.4%	69.6%
Milwaukee	28.7%	71.3%
Cleveland	40.1%	59.9%
Toledo	28.0%	72.0%
Total, All Ports	30.5%	69.5%

Source: Table 3a.

TABLE 23

DISTRIBUTION OF OVERSEAS GENERAL CARGO TRAFFIC AT PRINCIPAL
GREAT LAKES PORTS BY SUITABILITY FOR CONTAINERIZATION1970 - Including iron and steel semifinished products

<u>Port</u>	<u>Container Suitable</u>	<u>Not Container Suitable</u>
Chicago	10.8%	89.2%
Detroit	6.9%	93.1%
Milwaukee	16.4%	83.6%
Cleveland	7.2%	92.8%
Toledo	14.8%	85.2%
Total, All Ports	9.7%	90.3%

Source: Table 3.

TABLE 24

DISTRIBUTION OF OVERSEAS GENERAL CARGO TRAFFIC AT PRINCIPAL
GREAT LAKES PORTS BY SUITABILITY FOR CONTAINERIZATION1970 - Excluding iron and steel semifinished products

<u>Port</u>	<u>Container Suitable</u>	<u>Not Container Suitable</u>
Chicago	24.9%	75.1%
Detroit	20.5%	79.5%
Milwaukee	20.8%	79.2%
Cleveland	31.0%	69.0%
Toledo	28.0%	72.0%
Total, All Ports	23.4%	76.6%

Source: Table 3a.

has resulted in a relatively smaller share of total general cargo traffic being container suitable. Secondly, the forecasts of projected general cargo traffic at Great Lakes ports upon which the present projections are based were completed in 1967 by the U.S. Army Corps of Engineers, and are the same forecasts which form the basis of the original report. Furthermore, these forecasts were based on historical trends previous to 1960 and, as a result, could not have taken into account the subsequent growth in the shipping of iron and steel commodities. Consequently, it is probable that these projections are underestimates of what the actual future general cargo traffic will be. More recent analyses and forecasts are in process by the Corps of Engineers, but until they are completed and become available, the 1967 projections are the only forecasts which exist.

The third reason for the relatively small percentage of container-suitable general cargo is that due to the lack of adequate container facilities on the Great Lakes, a significant amount of container-suitable general cargo which would ordinarily be handled at one of the Great Lakes ports is being diverted to ports on the coasts at which container facilities already exist. The larger ports along both the east and the west, and gulf coasts are now competing for container-suitable traffic throughout the country, since the construction of new terminal facilities involves large capital outlays and consequently dictates intensive utilization of container berths in order to achieve the low unit

costs associated with containerization. As of the end of 1970, no container berths had been constructed at U.S. Great Lakes ports, yet there were 79 container berths at 20 U.S. seacoast ports. As a result, in 1970, the coastal ports accounted for over 90% of the U.S. containerized trade.⁵

In the Great Lakes region, Chicago will continue to be the major port and the only individual port to warrant the construction and operation of a fully integrated container berth. The other ports lack the traffic necessary to support a fully integrated container system. Since a modern fully integrated container berth is capable of handling up to 500,000 tons per year at a maximum operation, the other ports quite obviously do not need such a facility--the costs involved would be far greater than the potential savings. However, these ports should act not only to prevent the valuable container-suitable traffic generated within their hinterland from being diverted to the eastern ports, but also to recover the general cargo traffic which now travels in containers to the container berths on the east coast. In order to accomplish this these ports will have to provide some type of container facilities to make it economical for containerships to operate within the Great Lakes. A study by the Battelle Memorial Institute entitled Market Analysis Study of Container Suitable International Traffic at the Port of Cleveland has shown that for most general cargo commodities the Midwest exporter can enjoy a cost saving by shipping his cargo in containers through New York, rather than breakbulk through a

lake port.⁶ The study also concluded that most general cargo commodities could be shipped even more economically in containers through the port of Cleveland rather than overland via New York. To handle Cleveland's potential container traffic, Battelle advocated the construction of a combination berth designed to handle breakbulk shipments as well as containers of all sizes. Such a berth (which would be an open quay with the necessary land for storing containers, a warehouse away from dockside, and the land-based cranes and ancillary equipment) would cost Cleveland about \$3 1/2 million and could handle an estimated 100,000 tons annually.

On the basis of these studies and our projections, it is recommended that only the port of Chicago consider investment in the construction of a fully integrated container berth and that the other four ports, especially Detroit and Milwaukee, consider investment only in combination facilities such as those proposed in the Battelle study, in order to handle both containerized general cargo and the larger volume of general cargo unsuitable for containerization.

Most observers believe that for the foreseeable future most of the container traffic on the lakes will be handled by combination ships. The large container ships will be limited to the heavily tonnaged routes such as between New York and Antwerp and between New York and Rotterdam. It is uneconomical for these new ships to stop at the smaller ports around the world. Since there is considerable traffic between these smaller ports and U.S. ports, including those on the Great

Lakes, the combination or feeder vessels will play an important role in world trade even after containers have become widely used.

Although they are more economical than standard break-bulk vessels, the combination vessels limit the potential economies that can be achieved through containerization. The primary advantage of containers, the fast ship turnaround, is lost. While Battelle concluded that the combination vessels carrying a container from a lake port can presently compete successfully with the containership at an eastern port,⁷ their report did not consider the possible loss of traffic to eastern ports due to the proposed low cost unit trains and the possible reductions in shipping rates as shipowners compete to fill their new containerships. This type of competition may force the Great Lakes ports to consider either the construction of an additional fully integrated container berth in order to service the ports on the eastern lakes or the foregoing of this diverted cargo.

IV. Summary and Conclusions

The introduction of the container into ocean shipping began a revolution that has affected most of the world's shippers, shipowners and ports. The container's actual or potential economies have convinced over a dozen major U.S. and foreign flag firms, either alone or as partners, to invest large sums in the building of containers and specially designed containerships.

In addition to the full containerships, some lines are ordering new combination vessels or converting older ships into vessels capable of handling containers as well as breakbulk cargo.

The benefits of containerization include lower freight costs, faster delivery of goods, less pilferage and shipping damage, and the consequent lower insurance premiums and handling costs. The new containerships, at a modern berth, can load and unload within 24 hours, reducing the cost at port by as much as 75%. The rapid ship turnaround can, by itself, cut the cost of an ocean shipment by at least 25%. The potential savings due to containers are indeed significant.

There are, however, certain problems associated with containerization. Containers and containerships require special port facilities such as open quays, 10 to 20 acres of land or more per berth, and large, costly shore-based cranes. In addition, smaller ports cannot expect a great deal of container traffic because the containership is essentially a "load center" device--it will operate only at large ports and over heavily tonnaged routes. Thus the smaller ports, including the Great Lakes ports, are faced with the possibility of having much of their general cargo traffic rerouted to the larger container ports. The imbalance of container traffic between North America and the rest of the world is another problem the shipping firms have been unable to solve.

At present, a large number of containers come back to the United States empty.

However, none of these problems is serious enough to eliminate the economies associated with containerization. The larger coastal ports are building or expanding container facilities. New York has completed extensive facilities; other ports utilizing container facilities include Boston and Baltimore in the east and Oakland, Seattle, and Long Beach on the west coast. The gulf ports are providing increasing facilities.

At present there is only a relatively small amount of container traffic on the Great Lakes, and none of the U.S. lake ports have built even combination container-breakbulk facilities. As a result, a significant amount of container-suitable general cargo traffic originating in the Great Lakes region is currently being diverted by rail or truck to container terminals on the east coast.

In this report, the flow of general cargo traffic through the major Great Lakes ports has been analyzed in order to determine the amount of container-suitable traffic moving through the ports. Of the Great Lakes ports, Chicago was found to handle the most container-suitable traffic. The future flow of container-suitable general cargo traffic through the major lake ports has been projected based upon the trends in the flow of container-suitable traffic through these ports over the past decade and employing the forecasts of future general cargo traffic for lake ports through

the year 2015 as determined by the U.S. Army Corps of Engineers.

The estimates of container-suitable traffic that will be handled in the ports of Chicago, Detroit, Cleveland, Milwaukee, and Toledo are sufficiently large to justify considering the construction of some container facilities to handle this traffic.

However, the construction of fully integrated container facilities at each of the ports would result in an inefficient allocation of regional resources; only the individual port of Chicago will handle enough container-suitable traffic by 1975 to justify consideration of a fully integrated container berth. The other ports would handle container traffic most efficiently by providing only facilities capable of handling feeder or combination vessels. The combination or feeder vessels will probably dominate the movement of containers on the Great Lakes in the future, and these ports should be equipped to serve them efficiently. This may entail remodeling existing berths or constructing new facilities. In either case, the investment and operational costs will be less than that required for a fully integrated container berth.

It remains to be determined whether or not each of the ports handling container-suitable traffic needs to provide even minimal container facilities. It is entirely possible that a few of the ports might handle all the feeder traffic,

and that investment on the part of numerous ports would prove superfluous.

In the final analysis, there is a need for much more in-depth study of current data before any actual investment is undertaken. The projections in this report are based on the Corps of Engineers' forecasts of Great Lakes traffic. These forecasts are now almost a decade old and now have little to say about the future on the integrated St. Lawrence Seaway-Great Lakes System which was in its infancy 10 years ago.

Lack of current data is a great handicap at this point in time, when the competitive position of the lake system is being severely threatened by coast facilities. Given the long time lags usual between the planning and availability of port facilities, any lake port container facilities must be prepared to compete not only with today's rivals but also with those of several years from now.

The huge ocean carriers, limited by the physical capacity of the Seaway System, will be forever locked out of the Great Lakes. Nevertheless, as an integral part of the Canadian-U.S. shipping system, the Great Lakes-St. Lawrence Seaway still has an important part to play in the future of shipping.

No other waterway sits so close to the goods and markets in great central stretches of the United States and Canada. This is a tremendous comparative advantage for the system. Shipping by water remains, as it has been in the past, one

of the cheapest modes available. In times when the preservation of man's environment is a problem of catastrophic proportions, water transport stands out as the most ecologically advantageous of all modes.

Thus, the future of the Great Lakes and lake ports shows much promise. Nevertheless, the time has come for this system to establish its place in the more technically advanced North American shipping system. The large majority of future lake traffic can, if the forecasts in this paper are borne out, be expected to move most efficiently without containers. That portion which is containerizeable will have to move through the lake system by feeder ships to connect with the huge and fast ocean-going containerhips on the coasts.

The most important question now involves the determination of the role of each port within the lake system and the position of this system in the larger shipping systems of nations and continents. As total resources are becoming more and more limited, it is impossible to justify any investment in any port which does not fill a definite need.

The greatest gains to be made by the Great Lakes-St. Lawrence System will not be the result of the addition of a few container berths. These investments will be most useful only if the efficiency of the system as a whole is increased--if redundancies are eliminated and administration and information are improved. There are gains to be made by extending the system to its most efficient limits and by better understanding the problems of ice formation and control. The

future of each port lies in the future of the Lake-Seaway System. Any investment requires extensive evaluation with respect to its impact with this system.

APPENDIX A

COMMODITY NAME FOR SHIPPING STATISTICS, 1964

Code
No.

Item Name

Group 00 - Animals and Animal Products, Edible

005	Animals, edible
010	Meat and meat products, fresh or frozen
013	Meat and meat products, canned
017	Meat and meat products otherwise prepared or preserved
018	Meat and meat products otherwise prepared or preserved, including canned meat products
020	Animal oils and fats, edible
033	Condensed and evaporated milk
035	Dried milk
037	Cheese
039	Dairy products, not elsewhere classified
040	Fish and fish products, fresh or frozen, except shellfish
043	Fish and fish products, canned, except shellfish
045	Fish and fish products otherwise prepared or preserved, except shellfish
047	Fish and fish products otherwise prepared or preserved, except shellfish, including canned fish and fish products
049	Shellfish and products
050	Eggs and egg products
055	Edible animal products, not elsewhere classified

Group 0 - Animals and Animal Products, Inedible

060	Hides and skins, raw, except furs
065	Leather and leather manufactures
075	Furs and manufactures
080	Tallow, inedible
090	Animals, inedible
094	Shells, unmanufactured
095	Animal products, inedible, not elsewhere classified
098	Animal products, inedible, not elsewhere classified

Group 1 - Vegetable Food Products and Beverages

100	Corn
101	Rice
102	Barley and rye
103	Wheat

Appendix A, cont.

Group 1 - Vegetable Food Products and Beverages

- 104 Oats
- 107 Wheat flour and semolina
- 108 Grain sorghums
- 109 Other flour, flour and grain preparations, not elsewhere classified
- 110 Animal feeds (fodder and feeds), not elsewhere classified
- 120 Vegetables and preparations, fresh or frozen
- 123 Vegetables and preparations, canned
- 125 Vegetables and preparations, not elsewhere classified, including canned vegetables and preparations and soybean flour
- 127 Vegetables and preparations, not elsewhere classified, including soybean flour, edible
- 130 Fruits and preparations, fresh or frozen, except bananas
- 132 Bananas, fresh
- 133 Fruits and preparations, dried or evaporated
- 135 Fruits and preparations, canned, except juices
- 136 Fruit juices
- 137 Fruits and preparations otherwise prepared or preserved
- 138 Fruits and preparations otherwise prepared or preserved, including dried and evaporated and canned fruits and preparations
- 140 Nuts and preparations
- 150 Vegetable oils and fats, edible
- 160 Coffee, raw or green
- 161 Cocoa beans and shells
- 165 Tea, except impure tea, siftings, waste, etc.
- 167 Cocoa, chocolate, coffee and tea preparations and substitutes, not elsewhere classified
- 170 Spices
- 180 Sugar
- 185 Molasses, edible, honey, sirup and other related sugar products
- 190 Distilled spirits, malt liquors, and wines
- 195 Beverages and sirups, not elsewhere classified
- 199 Groceries and food, not elsewhere classified

Group 2 - Vegetable Products, Inedible, Except
Fibers and Wood

- 200 Rubber, crude, and allied gums
- 201 Synthetic rubbers
- 203 Rubber scrap and reclaimed rubber
- 205 Rubber tires and inner tubes

Appendix A, cont.

Group 2 - Vegetable Products, Inedible, Except Fibers and Wood

- 207 Rubber manufactures, not elsewhere classified
- 210 Naval stores, gums, and resins
- 220 Drugs (of vegetable origin), herbs, leaves, and roots,
crude
- 231 Soybeans
- 232 Flaxseed
- 233 Copra
- 234 Castor beans
- 235 Oilseeds, not elsewhere classified, including castor
beans
- 236 Oilseeds, not elsewhere classified, except castor beans
- 240 Vegetable oils, fats, and waxes, inedible and/or crude
- 250 Vegetable dyeing and tanning materials
- 260 Seeds, except oilseeds
- 280 Tobacco, unmanufactured
- 285 Tobacco, manufactured
- 290 Molasses, inedible
- 297 Vegetable products, inedible, not elsewhere classified

Group 3 - Textile Fibers and Manufactures

- 300 Cotton, unmanufactured
- 310 Cotton, semimanufactures, excluding cotton rags
- 320 Cotton manufactures, including cotton rags
- 324 Hemp, including manila or abaca, unmanufactured
- 326 Sisal, henequen and jute, unmanufactured
- 328 Vegetable fibers, unmanufactured, not elsewhere
classified
- 331 Burlap and jute bagging
- 335 Vegetable fiber semimanufactures and manufactures, not
elsewhere classified
- 340 Wool, unmanufactured
- 350 Wool, semimanufactures and manufactures
- 381 Man-made fibers and manufactures
- 390 Textile products, not elsewhere classified

Group 4 - Wood and Paper

- 400 Logs
- 401 Rafted logs
- 405 Posts, poles, and piling
- 408 Wood, unmanufactured, not elsewhere classified
- 413 Lumber and shingles
- 416 Wood containers and shooks; cooperage and cooperage
stock except empty barrels; plywood and veneers

Appendix A, cont.

Group 4 - Wood and Paper

- 417 Railroad ties
- 421 Wood manufactures, not elsewhere classified
- 430 Cork and manufactures
- 440 Pulpwood
- 441 Wood pulp
- 445 Paper base stocks, not elsewhere classified
- 450 Standard newsprint paper
- 457 Paper, related products, and manufactures, not elsewhere classified
- 460 Paperboard, except building board
- 475 Paper, related products, and manufactures, not elsewhere classified

Group 5 - Nonmetallic Minerals

- 501 Anthracite coal
- 502 Bituminous coal and lignite
- 503 Coal and coke briquets and related coal products, including liquid coal
- 504 Coke, including petroleum coke
- 507 Gasoline
- 510 Gas oil and distillate fuel oil
- 511 Petroleum, crude
- 512 Jet fuel, all types
- 513 Kerosene
- 514 Residual fuel oil, including bunker oil
- 516 Petroleum asphalt and products
- 518 Aliphatic naphtha (except motor fuel or gasoline), mineral spirits, solvents, and other finished light aliphatic products, not elsewhere classified
- 519 Lubricating oils and greases
- 520 Petroleum products, not elsewhere classified (Imports include 518)
- 522 Natural gasoline
- 523 Building cement
- 526 Building, monumental, and other stone, and stone manufactures, not elsewhere classified
- 530 Glass and glass products
- 540 Clays and earths
- 543 Brick and tile
- 547 Clay products, not elsewhere classified
- 548 Gypsum or plaster rock, including gypsum cements
- 549 Sulphur, liquid
- 550 Sulphur, dry (Imports and Exports include 549)
- 551 Limestone, crushed (not suitable for building or monumental purposes)

Appendix A, cont.

Group 5 - Nonmetallic Minerals

- 553 Salt*
- 554 Sand, gravel and crushed rock, except limestone
- 555 Nonmetallic minerals and manufactures, not elsewhere classified
- 556 Slag, metal refuse (included in 555 for Imports and Exports)

Group 6 - Metals and Manufactures, Except
Machinery and Vehicles

- 600 Iron ore and concentrates
- 601 Pig iron (including sponge iron)
- 602 Iron and steel scrap, including tin plate scrap
- 603 Iron and steel semifinished products
- 605 Iron and steel castings and forgings, including railway car and locomotive wheels, tires, and axles
- 606 Tools and basic hardware
- 607 Household, kitchen and hospital utensils, except of precious metals
- 608 Iron and steel pipe, tubes and tubing
- 609 Rolled and finished steel mill products, except iron and steel pipe, tubes and tubing
- 611 Metal manufactures and parts, except precious, not elsewhere classified, except SCi
- 612 Metal manufactures and parts, except precious, not elsewhere classified
- 613 Manganese, including ferromanganese
- 614 Chrome, including ferrochrome
- 615 Ferroalloys, ores, and metals, not elsewhere classified
- 617 Aluminum ores, concentrates (alumina), and scrap
- 618 Aluminum metal and alloys in crude and semifabricated forms
- 620 Copper ore, concentrates, unrefined copper and scrap
- 622 Refined copper in crude forms
- 624 Copper semifabricated forms
- 632 Copper-base alloy semifabricated forms and scrap
- 640 Lead ores, concentrates, and scrap
- 642 Lead and lead-base alloys in crude and semifabricated forms
- 652 Nickel ore, concentrates, scrap, and semifabricated forms
- 660 Tin ore, concentrates and scrap
- 662 Tin ore, concentrates, scrap and semifabricated forms
- 665 Tin metal in crude and semifabricated forms
- 670 Zinc ores, concentrates, and scrap
- 672 Zinc in crude and semifabricated forms

Appendix A, cont.

Group 6 - Metals and Manufactures, Except Machinery and Vehicles

- 682 Other nonferrous ores, concentrates, metals and scrap,
except precious, in crude and semifabricated forms
- 690 Precious metals and precious metal manufactures

Group 7 - Machinery and Vehicles

- 700 Electrical machinery and apparatus
- 701 Electrical machinery and apparatus, except SCi
- 710 Engines, turbines, and parts, not elsewhere classified,
except locomotives
- 722 Construction, excavating, mining and related machinery,
including materials handling and conveying machinery
and parts
- 730 Machine tools and other metal working machinery and
parts
- 731 Machine tools and other metal working machinery and
parts, except SCi
- 740 Textile, sewing, and shoe machinery, and parts
- 742 Other industrial machines and parts (including pumping
equipment), office machines, printing and bookbinding
machinery
- 745 Machinery and parts, not elsewhere classified, except
agricultural
- 770 Agricultural machinery, implements, and parts (including
tractors)
- 780 Automobiles, trucks, and busses, excluding parts,
accessories, and service equipment
- 781 Automobiles, trucks, and busses, except SCi
- 782 Automobile, truck, bus, and trailer parts and accessories,
and service equipment
- 783 Merchant vessels, other watercraft and parts
- 785 Merchant vessels, other watercraft and parts, except SCi
- 786 Railway locomotives, cars, parts, and accessories
- 787 Automobile, truck, bus, and trailer parts and accessories,
and service equipment, except SCi
- 790 Aircraft and parts, except radio equipment, including
military aircraft and parts
- 793 Aircraft and parts, except SCi
- 796 Vehicles and parts, not elsewhere classified

Group 8 - Chemicals and Related Products

- 801 Crude and refined coal tar, cyclic chemical tars
- 802 Benzol or benzene
- 805 Other coal tar and cyclic chemical products

Appendix A, cont.

Group 8 - Chemicals and Related Products

- 806 Other coal tar and cyclic chemical products, except SCi
- 810 Medicinal and pharmaceutical preparations
- 825 Sulphuric acid
- 826 Alcohols
- 827 Sodium Hydroxide or caustic soda
- 828 Other industrial chemicals, except SCi
- 829 Industrial chemicals, not elsewhere classified
(Imports include 826 and 846)
- 837 Synthetic resins in all unfinished and semifinished
forms, except laminated, film and sheeting, but
including scrap in all forms
- 844 Chemical specialties, not elsewhere classified, except
jet fuels
- 845 Carbon black
- 846 Chemical specialties, not elsewhere classified, except
jet fuels
- 847 Pigments, paints, and varnishes, except carbon black
- 848 Pigments, paints, and varnishes
- 849 Ammonium sulphate (fertilizer material)
- 851 Nitrogenous fertilizer and fertilizer materials, except
ammonium sulphate
- 852 Phosphate rock
- 854 Superphosphate
- 855 Potash fertilizer materials
- 859 Fertilizer and fertilizer materials, not elsewhere
classified
- 860 Miscellaneous chemical products
- 862 Dynamite
- 865 Soap and toilet preparations

Group 9 - Miscellaneous

- 900 Commodities, not elsewhere classified
- 901 Commodities, not elsewhere classified, except SCi
- 920 Articles, the growth, produce or manufacture of the
United States, returned
- 925 Water
- 926 Ice
- 930 Waste materials, not elsewhere classified
- 940 L.C.L. freight
- 970 Materials used in waterway improvement (Government
material)

Appendix A, cont.

Group 9 - Miscellaneous

980 Low-valued shipments
999 **Department of Defense controlled cargo and Special
Category Commodities

*Statistics on salt in this publication are included with "Nonmetallic minerals and manufactures, not elsewhere classified," commodity code 555, to avoid disclosure of individual company operations.

**Cargoes exported on Department of Defense controlled vessels (other than goods for the use of U.S. Armed Forces abroad) and non-Department of Defense shipments of military component items (abbreviated SCi) for which commodity detail is not furnished to the Corps of Engineers.

Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1964, Part 3, "Waterways and Harbors, Great Lakes," pp. iv-vi.

APPENDIX B

COMMODITY NAME FOR SHIPPING STATISTICS, 1970

<u>Code</u> <u>No.</u>	<u>Item Name</u>
Group 01 - Farm Products	
0101	Cotton, raw
0102	Barley and rye
0103	Corn
0104	Oats
0105	Rice
0106	Sorghum grains
0107	Wheat
0111	Soybeans
0112	Flaxseed
0119	Oilseeds, not elsewhere classified
0121	Tobacco, leaf
0122	Hay and fodder
0129	Field crops, not elsewhere classified
0131	Fresh fruits and tree nuts, except bananas and plantains
0132	Bananas and plantains
0133	Coffee, green and roasted (including instant)
0134	Cocoa beans
0141	Fresh and frozen vegetables
0151	Live animals (livestock), except zoo animals, cats, dogs, etc.
0161	Animals and animal products, not elsewhere classified
0191	Miscellaneous farm products
Group 08 - Forest Products	
0841	Crude rubber and allied gums
0861	Forest products, not elsewhere classified
Group 09 - Fresh Fish and Other Marine Products	
0911	Fresh fish, except shellfish
0912	Shellfish, except prepared or preserved
0913	Menhaden
0931	Marine shells, unmanufactured

Appendix B, cont.

Group 10 - Metallic Ores

1011 Iron ore and concentrates
1021 Copper ore and concentrates
1051 Bauxite and other aluminum ores and concentrates
1061 Manganese ores and concentrates
1091 Nonferrous metal ores and concentrates, not elsewhere
classified

Group 11 - Coal

1121 Coal and Lignite

Group 13 - Crude Petroleum

1311 Crude petroleum

Group 14 - Nonmetallic Minerals, Except Fuels

1411 Limestone flux and calcareous stone
1412 Building stone, unworked
1442 Sand, gravel and crushed rock
1451 Clay, ceramic and refractory materials
1471 Phosphate rock
1479 Natural fertilizer materials, not elsewhere classified
1491 Salt*
1492 Sulphur, dry
1493 Sulphur, liquid
1494 Gypsum, crude and plasters
1499 Nonmetallic minerals, except fuels, not elsewhere
classified

Group 19 - Ordnance and Accessories

1911 Ordnance and accessories

Group 20 - Food and Kindred Products

2011 Meat, fresh, chilled, or frozen
2012 Meat and meat products prepared or preserved, including
canned meat products
2014 Tallow, animal fats and oils
2015 Animal by-products, not elsewhere classified
2021 Dairy products, except dried milk and cream

Appendix B, cont.

Group 20 - Food and Kindred Products

- 2022 Dried milk and cream
- 2031 Fish and fish products, including shellfish, prepared or preserved
- 2034 Vegetables and preparations, canned and otherwise prepared and preserved
- 2039 Fruits and fruit and vegetable juices, canned and otherwise prepared or preserved
- 2041 Wheat flour and semolina
- 2042 Prepared animal feeds
- 2049 Grain mill products, not elsewhere classified
- 2061 Sugar
- 2062 Molasses
- 2081 Alcoholic beverages
- 2091 Vegetable oils, all grades; margarine and shortening
- 2092 Animal oils and fats, not elsewhere classified, including marine
- 2094 Groceries
- 2095 Ice
- 2099 Miscellaneous food products

Group 21 - Tobacco Products

- 2111 Tobacco manufactures

Group 22 - Basic Textiles

- 2211 Basic textile products, except textile fibers
- 2212 Textile fibers, not elsewhere classified

Group 23 - Apparel and Other Finished Textile Products, Including Knit

- 2311 Apparel and other finished textile products, including knit

Group 24 - Lumber and Wood Products, Except Furniture

- 2411 Logs
- 2412 Rafted logs
- 2413 Fuel wood, charcoal, and wastes
- 2414 Timber, posts, poles, piling, and other wood in the rough

Appendix B, cont.

Group 24 - Lumber and Wood Products, Except Furniture

- 2415 Pulpwood, log
- 2416 Wood chips, staves, moldings, and excelsior
- 2421 Lumber
- 2431 Veneer, plywood, and other worked wood
- 2491 Wood manufactures, not elsewhere classified

Group 25 - Furniture and Fixtures

- 2511 Furniture and fixtures

Group 26 - Pulp, Paper and Allied Products

- 2611 Pulp
- 2621 Standard newsprint paper
- 2631 Paper and paperboard
- 2691 Pulp, paper and paperboard products, not elsewhere classified

Group 27 - Printed Matter

- 2711 Printed matter

Group 28 - Chemicals and Allied Products

- 2810 Sodium hydroxide (caustic soda)
- 2811 Crude products from coal tar, petroleum, and natural gas, except benzene and toluene
- 2812 Dyes, organic pigment, dyeing and tanning materials
- 2813 Alcohols
- 2816 Radioactive and associated materials, including wastes
- 2817 Benzene and toluene, crude and commercially pure
- 2818 Sulphuric acid
- 2819 Basic chemicals and basic chemical products, not elsewhere classified
- 2821 Plastic materials, regenerated cellulose and synthetic resins, including film, sheeting, and laminates
- 2822 Synthetic rubber
- 2823 Synthetic (man-made) fiber
- 2831 Drugs (biological products, medicinal chemicals, botanical products and pharmaceutical preparations)
- 2841 Soap, detergents, and cleaning preparations; perfumes, cosmetics and other toilet preparations

Appendix B, cont.

Group 28 - Chemicals and Allied Products

- 2851 Paints, varnishes, lacquers, enamels, and allied products
- 2861 Gum and wood chemicals
- 2871 Nitrogenous chemical fertilizers, except mixtures
- 2872 Potassic chemical fertilizers, except mixtures
- 2873 Phosphatic chemical fertilizers, except mixtures
- 2876 Insecticides, fungicides, pesticides, and disinfectants
- 2879 Fertilizers and fertilizer materials, not elsewhere classified
- 2891 Miscellaneous chemical products

Group 29 - Petroleum and Coal Products

- 2911 Gasoline, including natural gasoline
- 2912 Jet fuel
- 2913 Kerosene
- 2914 Distillate fuel oil
- 2915 Residual fuel oil
- 2916 Lubricating oils and greases
- 2917 Naphtha, mineral spirits, solvents, not elsewhere classified
- 2918 Asphalt, tar, and pitches
- 2920 Coke, including petroleum coke
- 2921 Liquefied petroleum gases, coal gases, natural gas, and natural gas liquids
- 2951 Asphalt building materials
- 2991 Petroleum and coal products, not elsewhere classified

Group 30 - Rubber and Miscellaneous Plastics Products

- 3011 Rubber and miscellaneous plastics products

Group 31 - Leather and Leather Products

- 3111 Leather and leather products

Group 32 - Stone, Clay, Glass, and Concrete Products

- 3211 Glass and glass products
- 3241 Building cement
- 3251 Structural clay products, including refractories

Appendix B, cont.

Group 32 - Stone, Clay, Glass, and Concrete Products

- 3271 Lime
- 3281 Cut stone and stone products
- 3291 Miscellaneous nonmetallic mineral products

Group 33 - Primary Metal Products

- 3311 Pig iron
- 3312 Slag
- 3313 Coke (coal and petroleum), petroleum pitches and
asphalts, and naphtha and solvents
- 3314 Iron and steel ingots, and other primary forms includ-
ing blanks for tube and pipe, and sponge iron
- 3315 Iron and steel bars, rods, angles, shapes and sections,
including sheet piling
- 3316 Iron and steel plates and sheets
- 3317 Iron and steel pipe and tube
- 3318 Ferroalloys
- 3319 Primary iron and steel products, not elsewhere classi-
fied, including castings in the rough
- 3321 Nonferrous metals primary smelter products, basic
shapes, wire, castings and forgings, except copper,
lead, zinc and aluminum
- 3322 Copper and copper alloys, whether or not refined,
unworked
- 3323 Lead and zinc including alloys, unworked
- 3324 Aluminum and aluminum alloys, unworked

Group 34 - Fabricated Metal Products, Except
Ordnance, Machinery, and Transportation Equipment

- 3411 Fabricated metal products, except ordnance, machinery,
and transportation equipment

Group 35 - Machinery, Except Electrical

- 3511 Machinery, except electrical

Group 36 - Electrical Machinery, Equipment and
Supplies

- 3611 Electrical machinery, equipment and supplies

Appendix B, cont.

Group 37 - Transportation Equipment

- 3711 Motor vehicles, parts and equipment
- 3721 Aircraft and parts
- 3731 Ships and boats
- 3791 Miscellaneous transportation equipment

Group 38 - Instruments, Photographic and Optical
Goods, Watches and Clocks

- 3811 Instruments, photographic and optical goods, watches
and clocks

Group 39 - Miscellaneous Products of Manufacturing

- 3911 Miscellaneous products of manufacturing

Group 40 - Waste and Scrap Materials

- 4011 Iron and steel scrap
- 4012 Nonferrous metal scrap
- 4022 Textile waste, scrap, and sweepings
- 4024 Paper waste and scrap
- 4029 Waste and scrap, not elsewhere classified

Group 41 - Special Items

- 4111 Water
- 4112 Miscellaneous shipments not identifiable by commodity
- 4113 LCL freight
- 4118 Materials used in waterway improvement, Government
materials
- 9999 **Department of Defense controlled cargo and special
category items

*Statistics on salt in this publication are included with
"Nonmetallic minerals, except fuels, not elsewhere classified,"
commodity code 1499, to avoid disclosure of individual company
operations.

**Cargoes exported on Department of Defense controlled vessels
(other than goods for the use of U.S. Armed Forces abroad) and

Appendix B, cont.

non-Department of Defense shipments of military component items (abbreviated SCi) for which commodity detail is not furnished to the Corps of Engineers.

Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States, 1970, Part 3, "Waterways and Harbors, Great Lakes," pp. vi-viii.

APPENDIX C

IMPORTS - ALL GREAT LAKES PORTS - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0119			42
0121			1
0122			6,740
0129			430
0131	8		
0133			1,541
0134			16,081
0141	439		
0161		1,431	
0191			523
0841			67,557
0861			978
0911	288		
1412			1,002
1451			41,762
1471			13,425
1499			74,311
1911	227		
2011	166		
2012	1,412		
2015			888
2021	1,693		
2022			13
2031	4,374		
2034	24,684		
2039	6,468		
2041			15
2042			1,656
2062		11,855	
2081	69,725		
2091			11,915
2092			1,770
2099			6,589
2111	9		
2211	36,835		

Appendix C, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2212			2,412
2311	251		
2416	66		
2421			913
2431			66,332
2491	990		
2511	3,701		
2611			6,002
2631	6,886		
2691	318		
2711	593		
2811			1,130
2812	1,305		
2819	29,412		
2821	3,828		
2822			2,355
2823	649		
2831	546		
2841		342	
2851	255		
2861	11		
2876	21		
2879			13,103
2891	1,422		
3011	6,052		
3111	1,404		
3211	36,163		
3241			7,555
3251			12,369
3281			4,329
3291			3,891
3314			58,611
3315			704,270
3316			2,431,304
3317			112,814
3318			32,631
3319	52,470(1-1)		52,470
3321			9,801
3322	2,291		
3323		37,509	

Appendix C, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
3324			9,152
3411	64,610(1-1)		64,611
3511	17,435(1-3)		52,304
3611	13,434		
3711	26,329(1-3)		78,986
3721			10
3731			1,536
3791			7,871
3811	679		
3911	3,884		
4012			5,554

APPENDIX D

EXPORTS - ALL GREAT LAKES PORTS - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0119			108
0121			11
0122			293
0129			2,278
0131	213		
0141	66		
0161		1,939	
0841			81
0861			126
0911	38		
1451			113,036
1471			295
1491			35
1499			10,510
1911	2		
2011	41,897		
2012	238		
2014			99,952
2015			170,956
2021	13		
2022			66,176
2031	57		
2034	69,518		
2039	921		
2041			83,030
2042			204,007
2081	869		
2091			5,720
2092			2,491
2099			25,076
2211	146		
2212			1
2311	1,835		
2416	380		
2421			6,372

Appendix D, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2431			837
2491	196		
2511	38		
2631	4,521		
2691	140		
2711	791		
2812	130		
2816			18
2819	39,988		
2821	19,195		
2822			4,447
2823	141		
2831	663		
2841		2,762	
2851	444		
2861	799		
2871	38		
2876	1,964		
2879			35
2891	9,769		
3011	1,729		
3111	147		
3211	1,235		
3241			101
3251			523
3291			251
3311			73,746
3314			532,276
3315			7,359
3316			182,355
3317			715
3318			4,262
3319	44,000(1-1)		44,000
3321			3,323
3322	4,403		
3323	13		
3324			2,936
3411	1,660(1-1)		1,660
3511	13,430(1-3)		40,290
3611	5,553		

Appendix D, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
3711	7,725(1-3)		23,174
3721			55
3731			53
3791			1,186
3811	628		
3911	798		
4011			878,111
4012			8,866

APPENDIX E - IMPORTS

PORT OF CHICAGO - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0119			17
0122			10
0129			171
0131	5		
0133			4
0134			1,140
0141	154		
0161		1,113	
0191			264
0841			992
0861			511
0911	54		
1412			582
1451			518
1499			6,301
1911	42		
2011	2		
2012	726		
2015			392
2021	728		
2022			13
2031	2,299		
2034	7,528		
2039	3,316		
2041			7
2042			230
2062		2,621	
2081	32,200		
2091			6,817
2092			82
2099			5,666
2211	3,733		
2212			1,609
2311	81		
2416	58		

Appendix E - Imports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2421			450
2431			8,539
2491	443		
2511	1,484		
2631	1,427		
2691	76		
2711	382		
2811			1,131
2812	1,037		
2819	13,235		
2821	2,023		
2822			956
2823	648		
2831	499		
2841		238	
2851	112		
2876	21		
2879			20
2891	201		
3011	2,603		
3111	382		
3211	11,551		
3241			66
3251			7,327
3281			2,146
3291			1,339
3314			7,764
3315			163,347
3316			909,955
3317			36,327
3318			1,854
3319	30,825(1-1)		30,825
3321			5,098
3322	1,417		
3323		11,342	
3324			4,119
3411	36,043(1-1)		36,044
3511	6,181(1-3)		18,543
3611	5,623		
3711	7,046(1-3)		21,140

Appendix E - Imports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
3721			3
3731			258
3791			6,000
3811	346		
3911	1,864		
4012			1,759

APPENDIX E - EXPORTS

PORT OF CHICAGO - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0121			11
0122			138
0129			116
0131	202		
0161		1,560	
0841			61
0861			11
0911	19		
1451			110,074
1471			295
1499			9,224
2011	5,894		
2012	73		
2014			37,540
2015			75,459
2021	2		
2022			2,466
2031	4		
2034	2,414		
2039	347		
2041			21,686
2042			26,160
2081	695		
2091			3,540
2099			7,496
2211	94		
2311	77		
2421			1,434
2431			21
2491	75		
2511	16		
2631	3,228		
2691	114		
2711	651		
2812	32		

Appendix E - Exports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2816			16
2819	6,853		
2821	786		
2822			35
2823	35		
2831	500		
2841		1,425	
2851	237		
2861	137		
2871	38		
2876	162		
2879			35
2891	2,941		
3011	777		
3111	15		
3211	109		
3241			6
3251			208
3291			14
3311			16,209
3314			237,167
3315			1,313
3316			73,768
3317			10
3318			2,884
3319	20,984(1-1)		20,985
3321			807
3322	2,496		
3323	13		
3324			279
3411	573(1-1)		574
3511	3,425(1-3)		10,277
3611	1,168		
3711	537(1-3)		1,611
3721			14
3731			19
3791			239
3811	456		
3911	582		
4011			127,779
4012			4,424

APPENDIX F - IMPORTS

PORT OF DETROIT - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0119			7
0121			1
0129			11
0131	3		
0133			4
0141	110		
0161		32	
0191			128
0841			7,544
0861			108
0911	63		
1451			551
1499			39,775
1911	21		
2011	164		
2012	584		
2021	91		
2031	787		
2034	3,485		
2039	889		
2081	14,190		
2091			167
2092			37
2099			484
2111	2		
2211	1,634		
2311	123		
2416	1		
2421			273
2431			8,183
2491	113		
2511	926		
2631	376		
2691	34		
2711	99		

Appendix F - Imports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2812	2		
2819	3,553		
2821	240		
2831	30		
2841		10	
2851	23		
2891	795		
3011	865		
3111	487		
3211	16,646		
3251			1,783
3281			1,448
3291			1,328
3314			12,102
3315			361,419
3316			1,015,518
3317			10,502
3318			12,154
3319	10,577(1-1)		10,577
3321			1,415
3322	203		
3323		11,544	
3324			496
3411	12,968(1-1)		12,968
3511	4,852(1-3)		14,557
3611	3,135		
3711	7,240(1-3)		21,720
3721			5
3731			120
3791			171
3811	211		
3911	945		

APPENDIX F - EXPORTS

PORT OF DETROIT - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0129			50
0861			2
1451			769
1499			305
2011	530		
2012	22		
2014			30,153
2015			10,450
2031	35		
2034	40,772		
2039	54		
2042			1
2081	172		
2099			112
2211	3		
2212			1
2311	7		
2416	181		
2421			564
2431			271
2491	106		
2511	6		
2631	44		
2691	2		
2711	49		
2812	6		
2819	8,511		
2821	2,506		
2831	39		
2841		142	
2851	39		
2861	58		
2876	602		
2891	732		
3011	84		

Appendix F - Exports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
3111	1		
3211	508		
3251			110
3291			53
3311			17,304
3314			166,508
3315			977
3316			39,170
3317			65
3319	86(1-1)		87
3321			1,975
3322	44		
3324			32
3411	358(1-1)		359
3511	2,038(1-3)		6,113
3611	739		
3711	5,676(1-3)		17,029
3721			18
3731			9
3791			203
3811	41		
3911	48		
4011			375,357
4012			1,964

APPENDIX G - IMPORTS

PORT OF MILWAUKEE - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0122			6,290
0129			164
0134			5,977
0141	131		
0161		261	
0191			14
0841			3,676
0861			255
0911	29		
1412			420
1451			973
1499			33
1911	79		
2012	61		
2015			497
2021	830		
2031	856		
2034	2,061		
2039	1,297		
2041			8
2042			20
2081	8,749		
2091			892
2099			205
2111	7		
2211	11,644		
2212			55
2311	12		
2421			42
2431			48,404
2491	349		
2511	918		
2631	2,961		
2691	133		
2711	61		

Appendix G - Imports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2812	265		
2819	1,945		
2821	177		
2831	12		
2841		53	
2851	1		
2891	210		
3011	350		
3111	292		
3211	843		
3241			34
3251			724
3281			249
3291			178
3314			26,045
3315			3,553
3316			72,924
3317			30,065
3318			801
3319	2,923(1-1)		2,923
3321			780
3322	397		
3323		285	
3324			62
3411	3,984(1-1)		3,985
3511	2,168(1-3)		6,503
3611	2,288		
3711	219(1-3)		657
3731			195
3791			870
3811	39		
3911	494		

APPENDIX G - EXPORTS

PORT OF MILWAUKEE - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0119			108
0122			155
0129			1,287
0131	3		
0161		369	
0841			20
0911	18		
1451			887
1911	2		
2011	35,422		
2012	100		
2014			9,232
2015			53,365
2022			7,787
2034	768		
2039	143		
2041			24,062
2042			3,377
2081	2		
2099			14,460
2211	37		
2311	1,734		
2421			743
2431			10
2511	10		
2631	708		
2691	7		
2711	62		
2812	29		
2819	563		
2821	157		
2822			5
2823	34		
2831	74		
2841		58	

Appendix G - Exports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2851	81		
2861	358		
2876			2
2891	96		
3011	79		
3111	132		
3211	2		
3291			52
3314			589
3315			31
3317			352
3319	276(1-1)		277
3321			4
3322	1,693		
3324			1
3411	301(1-1)		302
3511	4,725(1-3)		14,177
3611	168		
3711	499(1-3)		1,498
3721			8
3731			25
3791			278
3811	47		
3911	108		
4011			139,105
4012			838

APPENDIX H - IMPORTS

CLEVELAND HARBOR - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0119			18
0129			67
0141	36		
0161		24	
0191			95
0841			63
0861			103
0911	11		
1451			1,797
1499			23,892
1911	13		
2012	9		
2021	39		
2031	364		
2034	882		
2039	764		
2081	6,872		
2091			667
2092			1,651
2099			179
2211	649		
2212			99
2311	29		
2416	7		
2421			110
2431			1,100
2491	63		
2511	366		
2631	635		
2691	74		
2711	37		
2819	3,080		
2821	267		
2822			586
2831	5		

Appendix H - Imports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
2841		41	
2851	114		
2861	11		
2879			125
2891	211		
3011	1,595		
3111	176		
3211	1,724		
3241			1,208
3251			1,685
3281			384
3291			509
3314			12,300
3315			107,813
3316			299,467
3317			846
3318			58
3319	4,823(1-1)		4,824
3321			296
3322	243		
3323		784	
3324			1,102
3411	8,071(1-1)		8,072
3511	2,004(1-3)		6,014
3611	1,855		
3711	1,841(1-3)		5,523
3731			925
3791			493
3811	68		
3911	513		
4012			2,369

APPENDIX H - EXPORTS

CLEVELAND HARBOR - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0129			219
0131	2		
0161			3
0911	1		
1451			345
2011	1		
2012	42		
2014			8,140
2015			186
2021	11		
2031	19		
2042			41
2092			2,491
2099			5
2211			12
2416	199		
2421			2,370
2431			52
2511	5		
2631	405		
2691			9
2711	28		
2816			2
2819	2,118		
2821	218		
2822			3,228
2823	72		
2831	2		
2841		35	
2851	78		
2891	3,039		
3011	527		
3211	45		
3241			95
3251			144

Appendix H - Exports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
3291			133
3311			10,815
3314			106,726
3315			1,133
3316			41,095
3317			201
3318			814
3319	1,848(1-1)		1,849
3321			83
3322	65		
3324			380
3411	371(1-1)		372
3511	1,492(1-3)		4,476
3611	2,642		
3711	612(1-3)		1,838
3721			7
3791			183
3811	37		
3911	43		
4011			4,395
4012			1,239

APPENDIX I - IMPORTS

TOLEDO HARBOR - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0129			17
0133			1,001
0141	10		
0191			23
0841			6,617
1471			13,425
1499			85
2012	33		
2021	3		
2031	15		
2034	5,936		
2039	37		
2062		9,234	
2081	5,778		
2091			2,741
2211			1,528
2311	5		
2431			90
2491	19		
2511	3		
2611			2,583
2631	1,432		
2711	6		
2819	37		
2821	81		
2822			37
2823	1		
2851	6		
2879			12,958
2891	4		
3011	433		
3111	50		
3211	3,455		
3251			733
3281			102

Appendix I - Imports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
3291			525
3314			233
3315			62,488
3316			108,949
3317			22,881
3319	2,810(1-1)		2,810
3321			178
3322	31		
3323		13,555	
3324			383
3411	2,141(1-1)		2,142
3511	1,391(1-3)		4,173
3611	69		
3711	9,973(1-3)		29,921
3721			2
3731			6
3791			220
3811	7		
3911	50		
4012			550

APPENDIX I - EXPORTS

TOLEDO HARBOR - 1970
(Short Tons)

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
0129			291
0861			113
1451			494
2011	50		
2015			1,455
2034	83		
2039	9		
2041			5,729
2042			34,719
2099			672
2311	16		
2421			719
2431			482
2491	7		
2631	5		
2691	8		
2711	1		
2819	155		
2821	103		
2822			467
2841		3	
2851	9		
2876	4		
2891	180		
3011	262		
3211	568		
3251			61
3314			20
3315			184
3316			1,162
3317			11
3321			251
3322	3		
3324			48
3411	46(1-1)		47

Appendix I - Exports, cont.

<u>Commodity No.</u>	<u>A</u>	<u>B</u>	<u>C</u>
3511	1,304(1-3)		3,914
3611	196		
3711	349(1-3)		1,047
3721			5
3791			1
3811	10		
3911	9		
4011			16,175
4012			362

FOOTNOTES

¹Chicago Association of Commerce and Industry, Transport Comments, December 29, 1972, p. 3.

²U.S. Army Corps of Engineers, North Central Division, Great Lakes-Overseas General Cargo Traffic Analysis (Chicago, Illinois, March, 1967).

³Eric Schenker, Effects of Containerization on Great Lakes Ports, Special Report No. 2, Center for Great Lakes Studies, University of Wisconsin-Milwaukee (January, 1968), p. 14.

⁴Alfred Maizels, Industrial Growth and World Trade (Cambridge: Harvard University Press, 1967), p. 403.

⁵C. Charles Kimm, "The Impact of Containerization on Port Design," in Littoral Lines, Battelle Memorial Institute (October, 1972), p. 1.

⁶Battelle Memorial Institute, Market Analysis Study of Container Suitable International Traffic At the Port of Cleveland (Columbus, Ohio, May, 1967), pp. 69 and 70.

⁷Kimm, loc. cit.

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